

IT REVOLUTION

CAROLINA THEATRE • CHARLOTTE, NC

Enterprise AI Summit 2026

The Tech Stack Below TPS

Art Smalley • Art of Lean, Inc.

Wednesday, October 7, 2026

ARTOFLLEAN.COM

I build a lot of simple tools

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LEI Fundamentals

Foundational lean knowledge and AI coaching — look up the language, work through real situations, and build your AI skills.



Lean Lexicon

More than a glossary — search lean terminology, generate illustrative images, and tailor examples to your own situation.



Genba Coach

AI grounded in LEI source material — search the lean knowledge base, ask focused questions, or dialogue through a real problem or situation.



AI Workshop

Hands-on practice in basic prompting — using AI as a Lean thinking partner through the PDCA loop: Prompt, Do, Check & Act.

Problem Solving & Coaching

Structured problem-solving tools for continuous improvement.



Evaluate My A3

Upload your A3 and receive expert AI feedback — from supportive first-timer guidance to rigorous executive review.



RootCoach

AI-guided root cause analysis using 5-Why methodology with coaching at every step.



Next Steps Coach

AI-powered coaching for identifying and prioritizing actionable next steps from problem-solving sessions.

HOW I TEACH DOMAIN EXPERTS WHO DON'T CODE

Five levels of AI proficiency

LEVEL 1

Chat

Deliberate questions

*M365 Copilot Chat,
ChatGPT, Claude*

LEVEL 2

Structured Prompting

Role, context, method, constraints, format

*Same tools,
better prompts*

LEVEL 3

Adding Your Knowledge

The model works from your material

*Files in M365 Copilot,
ChatGPT and Claude Projects,
SKILL.md files*

LEVEL 4

Custom Tools

Own interface, instructions, knowledge

*Copilot Studio agents,
custom GPTs,
Claude Code, Codex*

LEVEL 5

Agents

Multi-step work on its own

*Copilot Studio workflows,
Microsoft Foundry,
Azure portal,
Claude Code, Codex*

There is a T in Toyota, TPS, Technology – and Tribes

HORIZONTAL – IN THE BOOKS

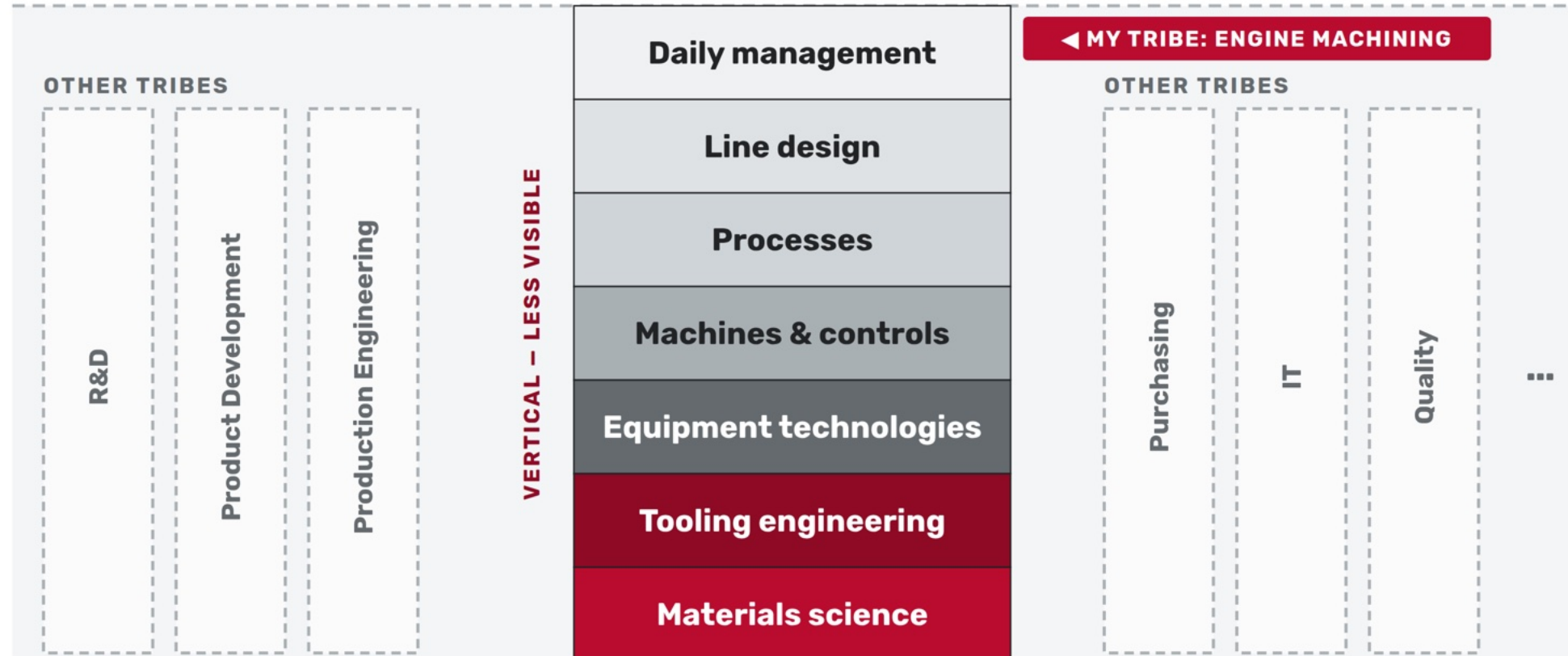
Standardized work • Kanban • JIT • Andon • Kaizen • Takt • A3

*The Machine That
Changed the World*

Lean Thinking

The Toyota Way

*Toyota
Production System*



WHERE I WORKED IN TOYOTA

Kamigo Engine Plant, Toyota City • Established 1965



Kamigo plant gate エンジンの故郷 • Home of Engines



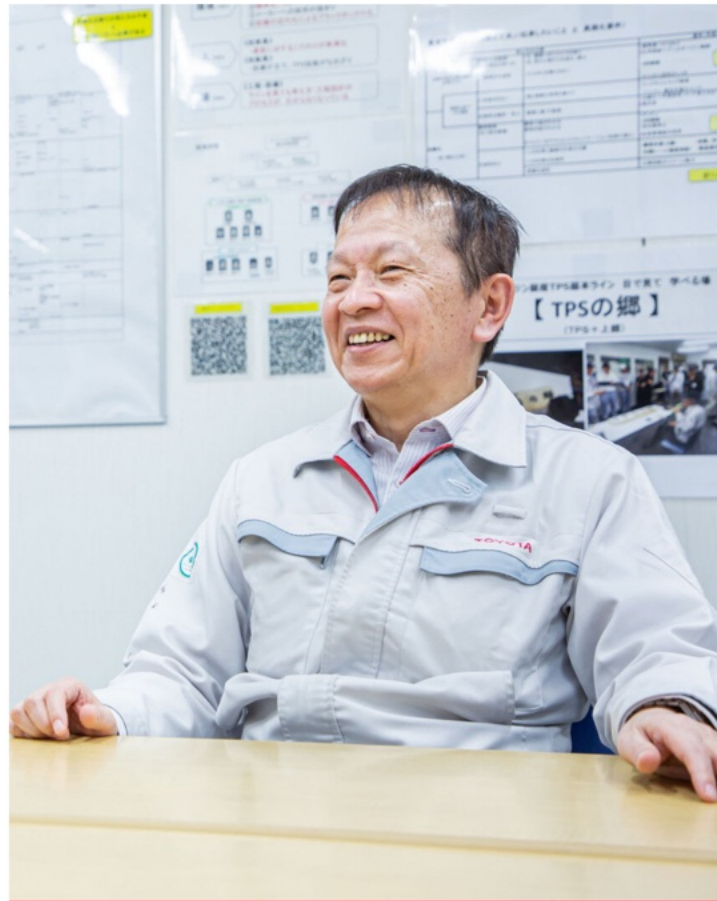
Taiichi Ohno founding plant manager

INSIDE

TPS の郷・Home of TPS



TPS no Sato Home of TPS



Leading TPS

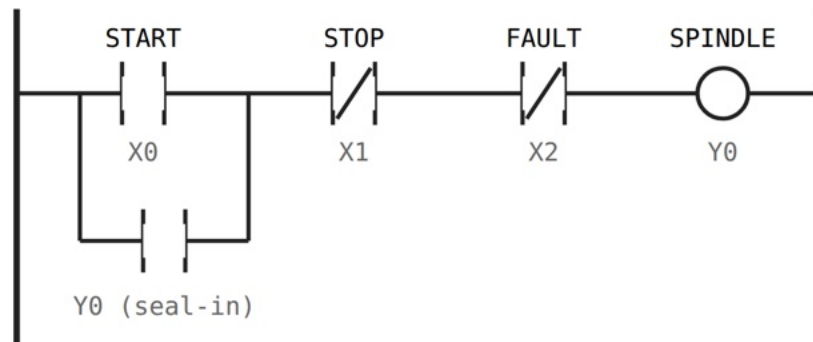


Automated Machining Lines

Learning to program



TOYOPUC PC1 Toyota's own PLC



Ladder logic PLC



FANUC servos • CNC drives • pendants

```
01001 (CRANK BALANCE DRILL)
N10 G90 G54 G17 G21
N20 T01 M06 (DRILL 8MM)
N30 S1200 M03
N40 G00 X42.5 Y-17.3
N50 G43 H01 Z5.0
N60 G81 Z-6.2 R2.0 F80
N70 G80
N80 G00 Z50.0 M05
N90 M30
```

G-code CNC

1989

Japan to Georgetown: 100,000 spare parts



Georgetown, Kentucky under construction, May 1987



~100,000 spare parts



Hayes Smartmodem 2400

■ TECHNICAL EXCELLENCE

NOMINEES

Compaq Portable II/Compaq Computer Corp.

IBM PC Convertible/
IBM Corp.

Gridcase 3/
Grid Systems Corp.

Keystyle 80/Quadram Corp.

Toshiba T3100/
Toshiba America Inc.

Toshiba T1100 Plus/
Toshiba America Inc.

Zenith Z-181 Portable PC/
Zenith Data Systems

FINALISTS

Gridcase 3/
Grid Systems Corp.
Larry Gravelle
Karl Nakamura
Dennis Mitchell

Toshiba T3100/
Toshiba America Inc.
Tetsuya Mizoguchi
Haruhiko Banno
Yasuo Suzuki

Toshiba T1100 Plus/
Toshiba America Inc.
Tetsuya Mizoguchi
Ginzo Yamazaki
Nobuyuki Tanaka

Zenith Z-181 Portable PC/
Zenith Data Systems
Robert Dilworth

PORTABLE COMPUTERS

Tetsuya Mizoguchi Haruhiko Banno Yasuo Suzuki

TOSHIBA T3100

Toshiba America Inc.

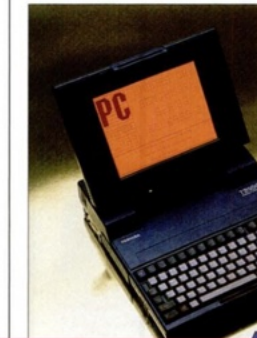
Technical excellence comes in many forms, not the least of which is packaging. Toshiba's T3100 is a perfect example: It takes existing parts and technologies and assembles them in an amazingly compact machine that rivals the IBM PC AT in performance. It uses surface-mount

technology to maximum advantage, and the power supply is a jewel of miniaturization. With its 80286, 10-megabyte hard disk, 3½-inch floppy disk drive, and crisp plasma display, the T3100 has become a favorite of consultants.

Tetsuya Mizoguchi joined Toshiba in 1963. He has been involved in the development of medium- and large-scale computers, Japanese word processors, and other data processing equipment. He is General Manager of Engineering, Ome Works, where the Toshiba T1100, T1100 Plus, and T3100 were developed.

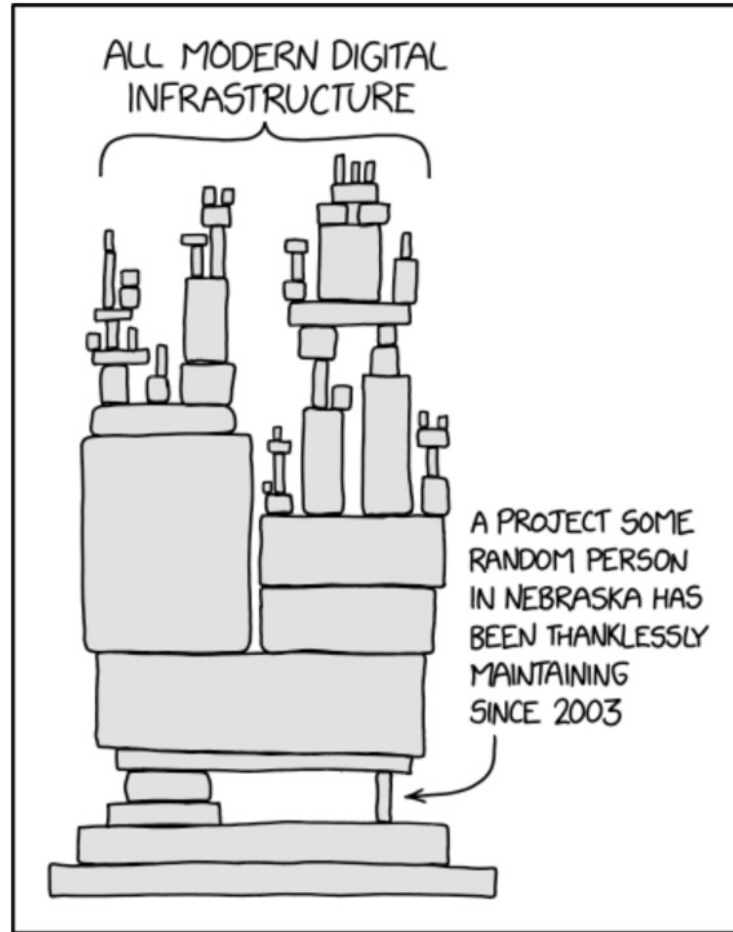
Yasuo Suzuki joined Toshiba in 1972. He has been involved in the development of mass storage peripherals and small business computers. He was assigned to Toshiba America from 1981 to 1983. He is now Staff Engineer in the Personal Computer Group, Office Automation Equipment Department, Ome Works, which developed the T3100.

Haruhiko Banno joined Toshiba in 1968. He has been involved in the development of medium- and large-scale and personal computers. He is now Manager of the Personal Computer Group, Ome Works.

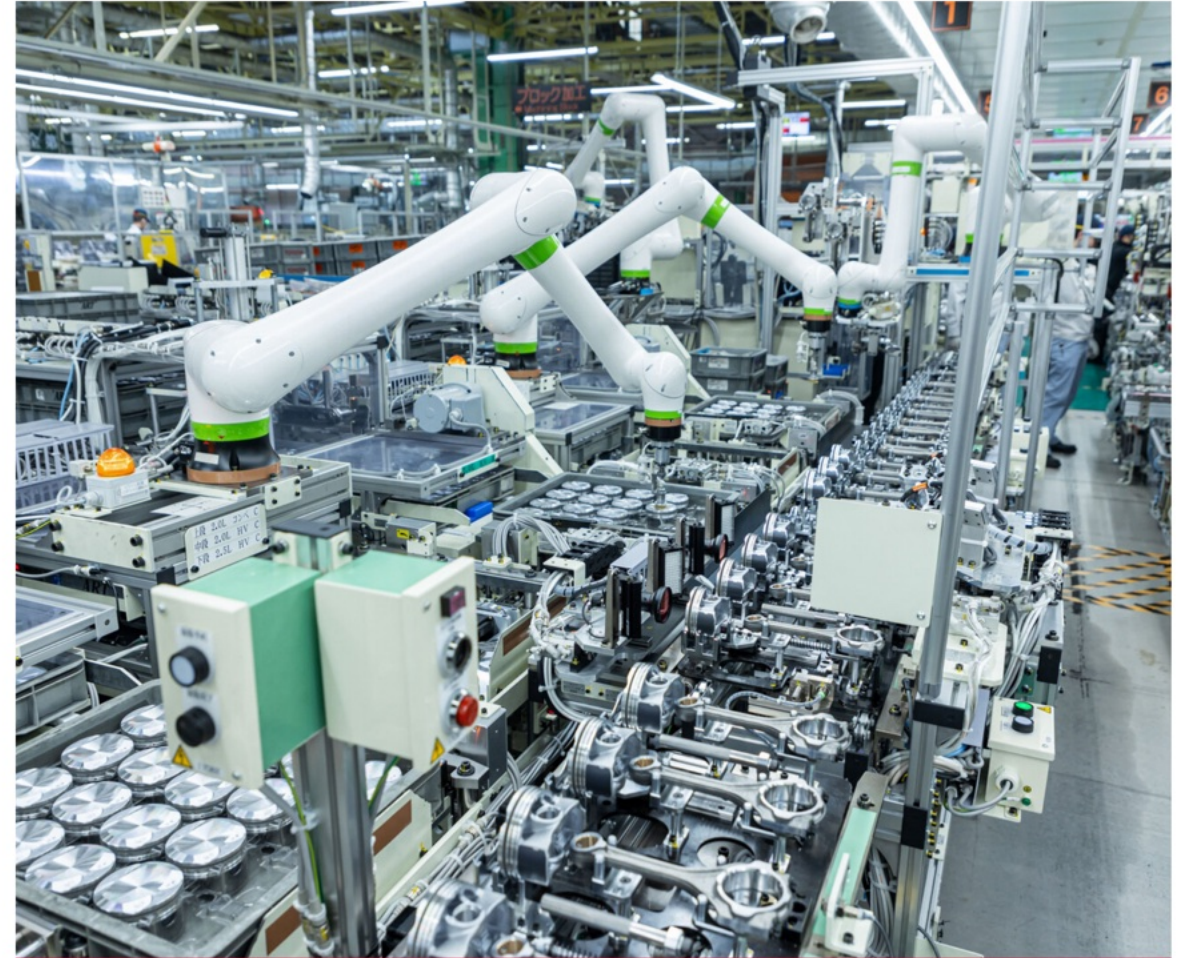


Toshiba J3100 • dBASE III PC Magazine 1987

The dependency nobody sees



xkcd 2347 Dependency



Kamigo automated machining line

100% CORRECT

The visible layer is real. It is the surface.



Flow • takt • standardized work • andon



Daily management board

What a web page doesn't show



1 What you see – the rendered page

2 Browser – HTML, CSS, JavaScript

3 Network – requests and APIs

4 Application and data – code, databases

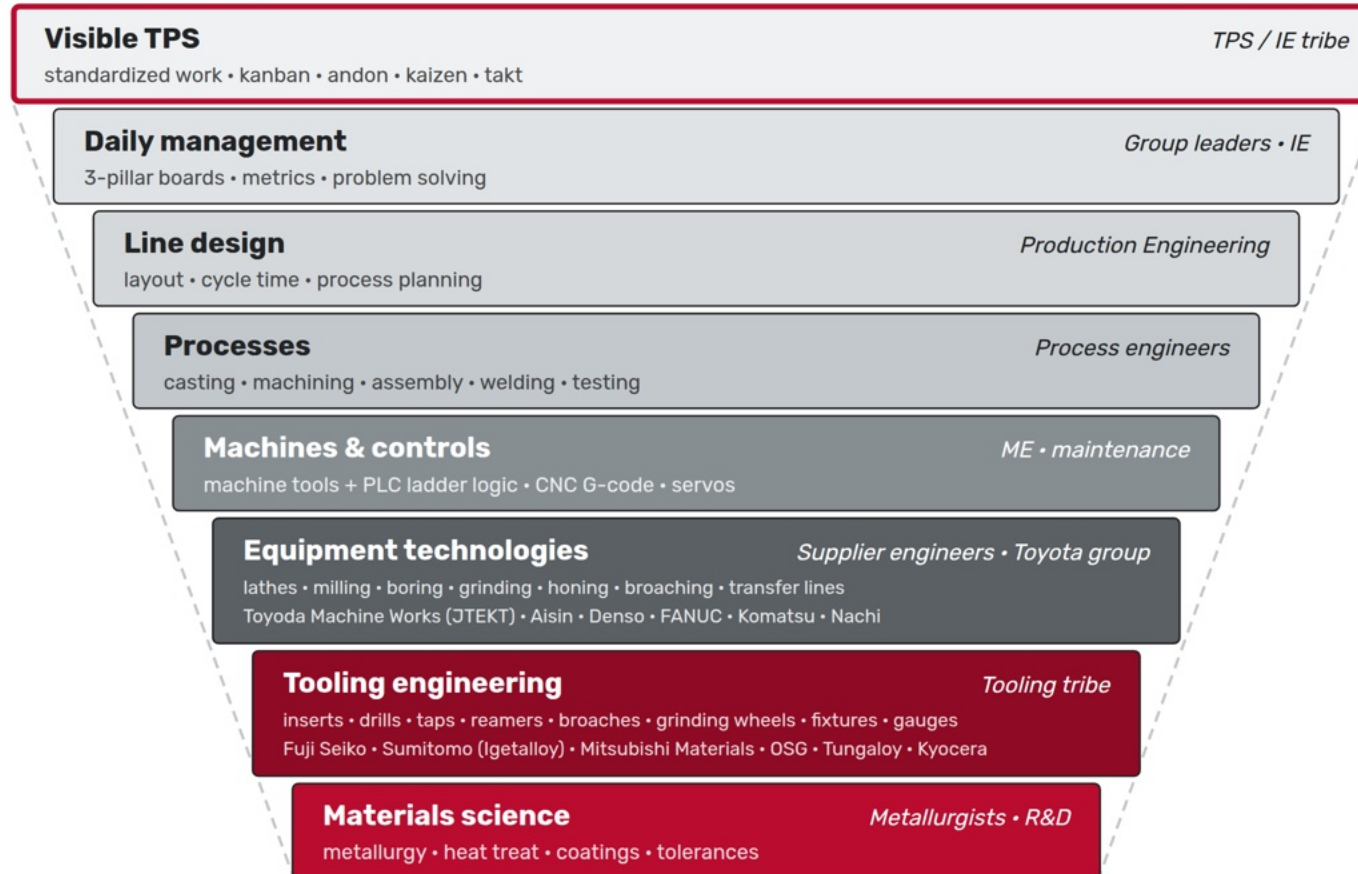
5 Execution – runtimes, OS, machine code

6 Hardware – chips, memory, fabrication

The Tech Stack Below TPS

WHAT THE WORLD SEES

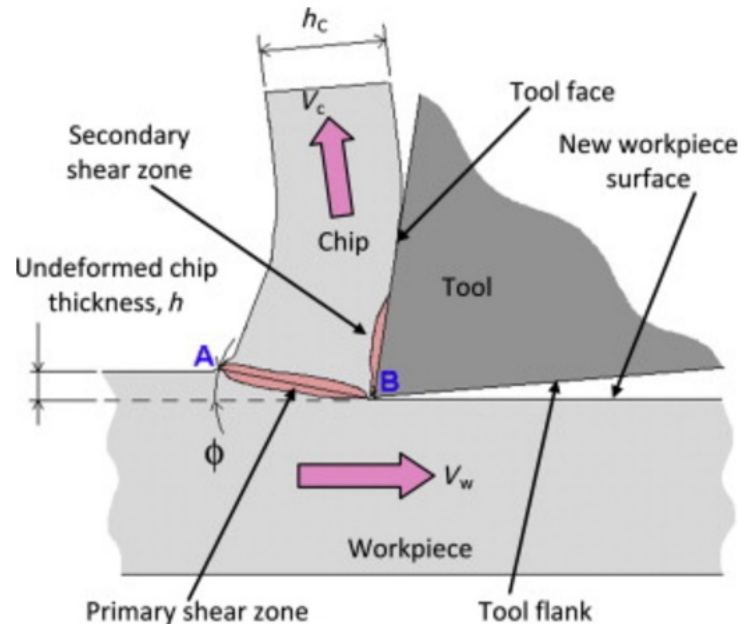
WHO LIVES THERE



My tribe machining engineer

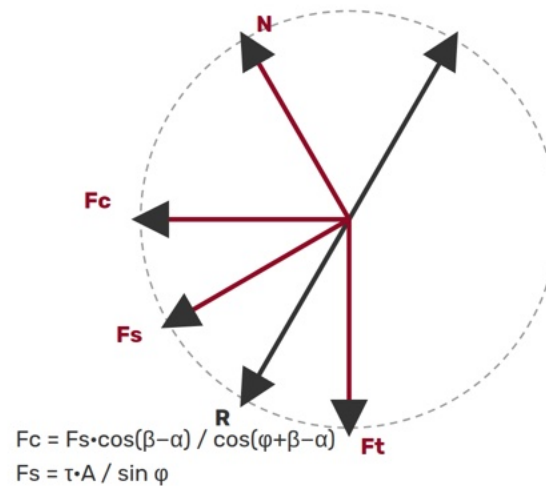
Each layer down: more important • fewer people know it • more invisible • harder to fix • same as software

A less visible TPS vertical: machining

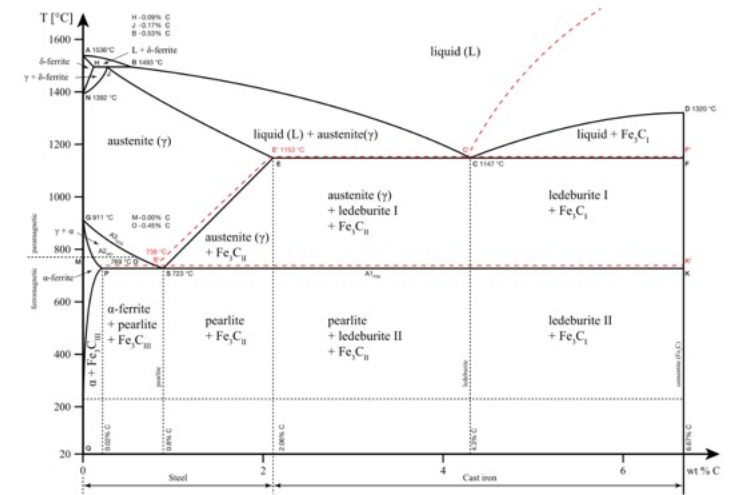


Chip formation

Merchant's circle



Cutting force calculation



Materials science

It's in Toyota's own literature

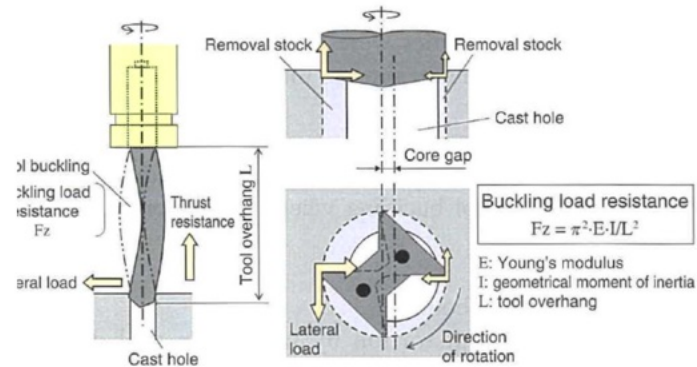
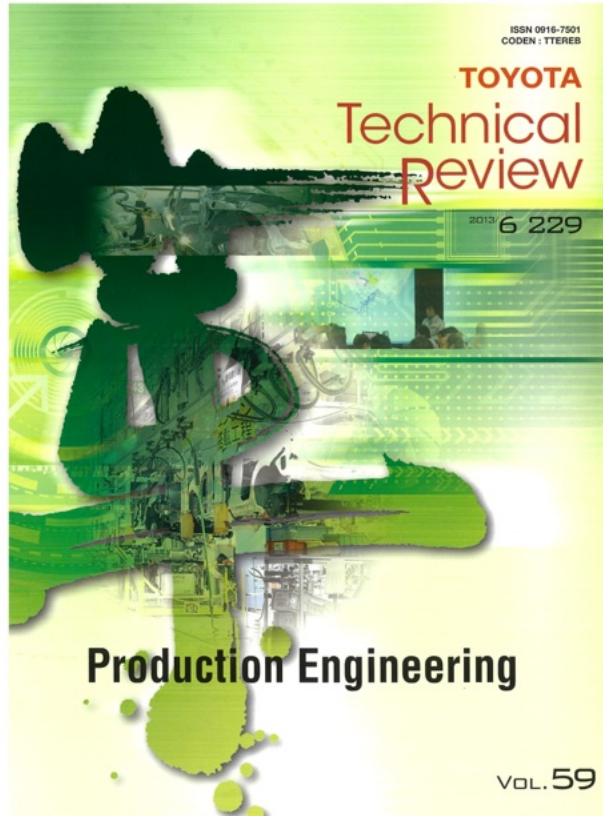


Fig. 5 Mechanism of Hole Distortion

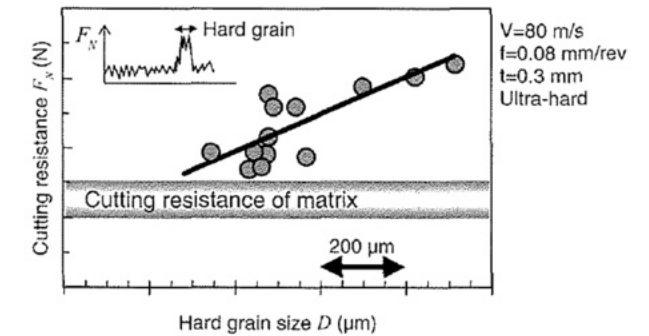


Fig. 15 Relationship between Hard Grain Size and Cutting Resistance in Stand-Alone Machinability Test

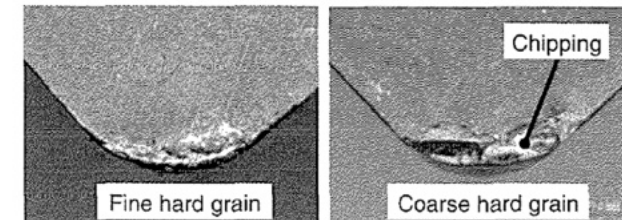


Photo 3 Appearance of Cutting Tool after Stand-Alone Machinability Test

Vol. 59, 2013

Production Engineering issue

Vol. 59 drill buckling • $Fz = \pi^2 EI / L^2$

Vol. 64, 2018

hard grain size vs cutting resistance

KAMIGO TODAY

Software and AI are in the stack, and you can't see it



Piston line fully automated, Jan 2025



Control center, Machining Plant No. 7 ~300 machines



Spindle torque per cycle alarm on drift



Senior Expert Ito, Expert Kawai Toyota Times

Building Small Tools at Toyota



1989 A resource problem

IT had no time • we built our own • dBASE III



2026 A governance problem

Safety • security • approvals • Toyota D-R00M: the exception

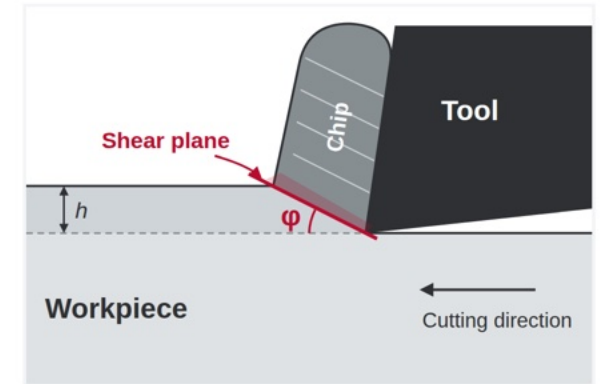
Today: easy to hand people AI tools • hard to let them build tools

AI surfaces the problem; it does not resolve it.

3-4 people • one engine plant

A cutting-materials management program

Also: coolant condition • leak-test trends • change-point records



Outside vendor

X

Market too small

Internal IT

X

No time • no domain knowledge

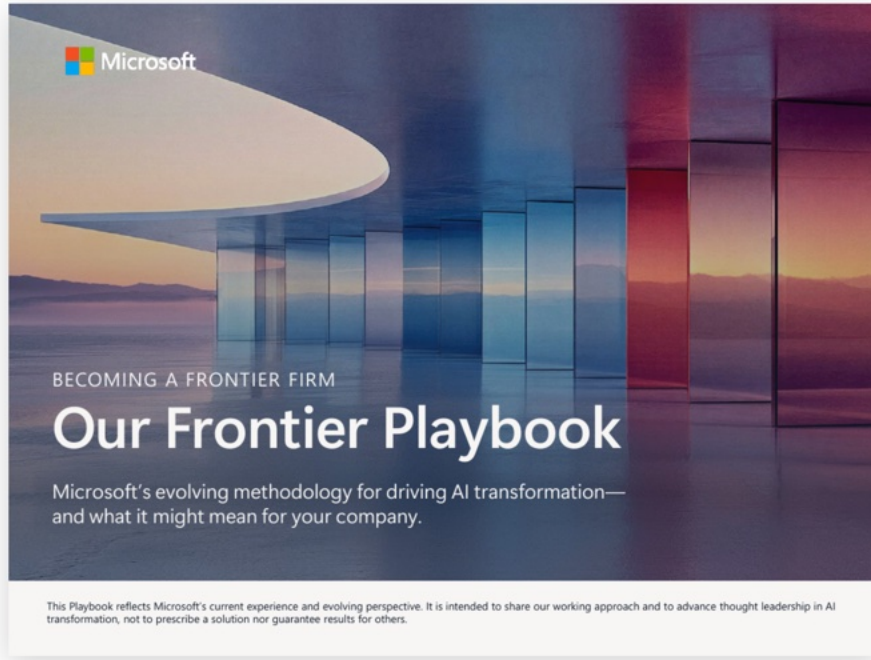
Plant team

✓ can build with AI

X no approval path

Every domain has cases like this. Unresolved.

Most AI playbooks start at enterprise scale



One example: Becoming a Frontier Firm

Microsoft • Our Frontier Playbook • September 2026

- ✓ "Lean before agents" • Gemba
- ✓ Citizen developers • sandbox governance
- ? How does a domain expert build and run a tool for 3-4 people?

▲ This playbook

Software is the product

Most people near the work can code

Software supports the product

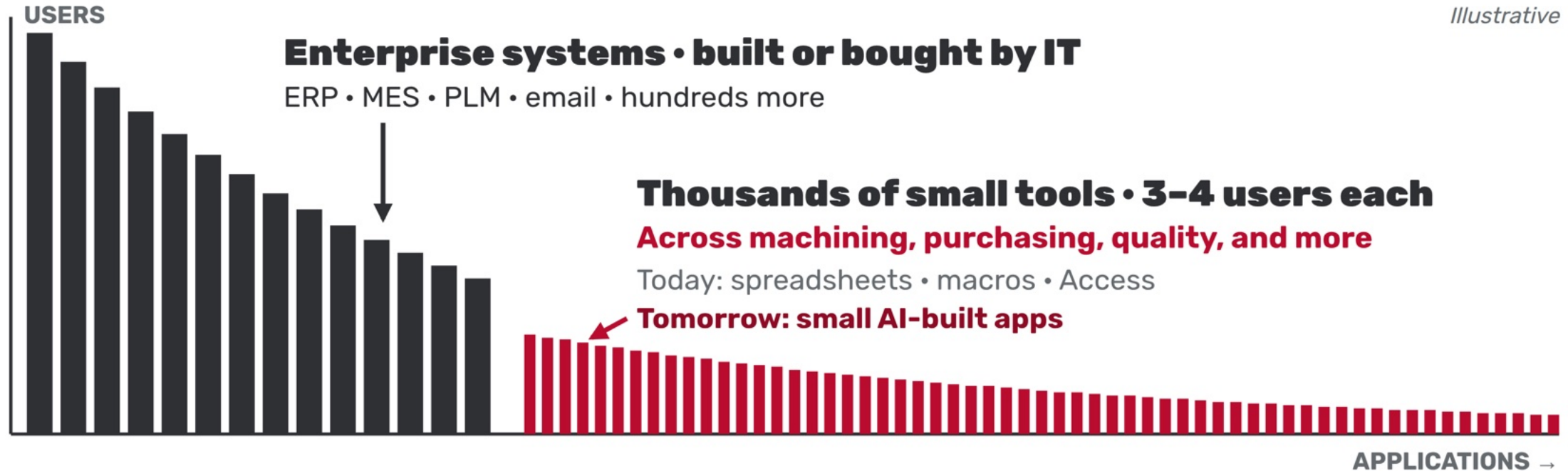
Few people near the work can code

Hardware manufacturing • national labs • defense • regulated industries

WHAT'S COMING • SPECIFIC USE CASES, VERY FEW USERS

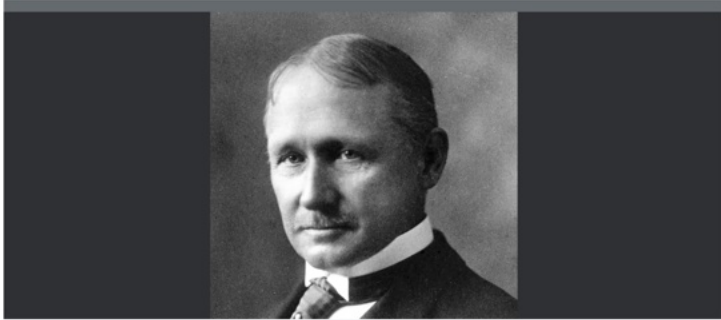
The long tail of applications

Illustrative



Many of these problems are too specific for a vendor product and too small for a central IT project.

Who does the thinking?

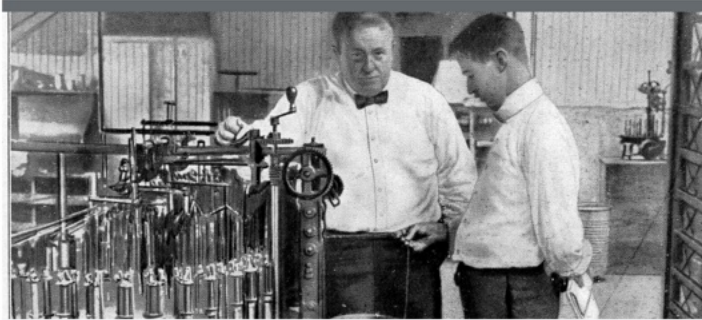


1880s–1910s

Frederick Taylor: scientific management

- Brilliant on objects: metal cutting, high-speed steel, tooling engineering
- Applied to people as time study. Thinking separated from doing
- Labor and management on opposite sides of the fence

The expert thinks. The worker does.



1910s to today

Thinking centralized in specialists

- Analysis and improvement handed to specialist staffs. IE is one example
- Powerful methods: motion study, process charts, work simplification
- Workers are informed after the fact, not involved in the thinking

The IE thinks. The worker is told.



1950s onward • Toyota

Improvement by the people doing the work

- Analysis and improvement taught to workers and supervisors on the line
- Same methods: time study, standardized work, kaizen, plus jidoka and pull
- Specialists still exist. They support the line rather than think for it

The worker thinks. The supervisor coaches.

Software tools are at the same fork in the road.

Small-team applications in large organizations

ESTABLISHED PATH

Enterprise delivery

IT-built or purchased systems

UNCLEAR PATH

Small-team application

3-4 users • sign-on • custom data model • tailored UI • AI integration

ESTABLISHED PATH

Approved platforms

Copilot • Copilot Studio •
Power Platform templates

IT sets the guardrails once

WHAT SMALL TOOLS NEED TO BE BUILT AND USED SAFELY

A place to build

approved site • database •
appropriate data access

Risk-based review

data and actions matter, even
for 3-4 users

Building capability

frame the need • guide AI •
evaluate and debug

DENSO SOMRIE / CIP

Ownership

named owner for support,
changes, and retirement

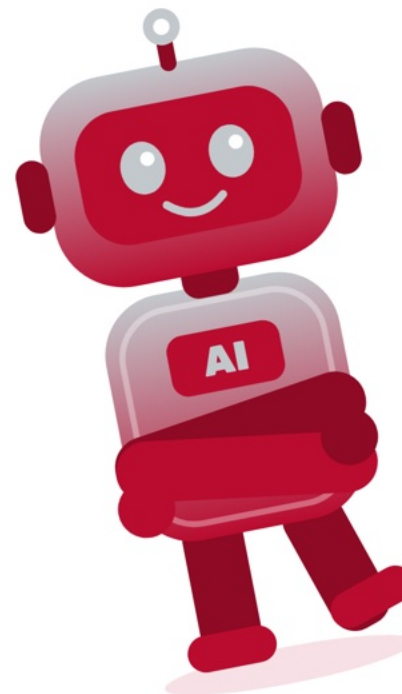
Block the tail → shadow IT • **Full SDLC for every tool** → IT overwhelmed • **Needed:** a right-sized lifecycle

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TOYOTA, SINCE 1953

**Good Thinking,
Good Products**

Thank you



Art Smalley

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